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ECONOMIC COMMISSION FOR ASIA AND THE FAR EAST.

Committee for Co-ordination of Investigations
of the Lower Mekong Basin.

(Cambodia, Laos, Thailand and Viet-Nam)

REPORT OF THE FRENCH SEDIMENTATION MISSION

by

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The French Sedimentation Mission will have completed its work on 30 November 1963. We are submitting to-day a summary of the conclusions we already have reached. These conclusions will be further completed and elaborated upon when the analytical data, some of which have not yet been submitted by the relevant Cambodian services, are being processed and prepared.

The sedimentation Mission had two problems to solve:

1 - What is the rate of sediment accumulation in the Great Lake in the recent past?

2 - Preparation of broad sedimentation budget of the Great Lake Basin.

The former was dealt with in two publications, one in the Cahiers du Pacifique, and the other with the Société Géologique de France. A summary of the conclusions "Sur la vitesse de colmatage du Grand Lac au Cambodge" (Sedimentation rate of the Great Lake). This note was sent to the Committee on the 5th August through the French Representation in Bangkok.

The conclusions we already have reached are as follows:

- firstly, a coherent and constant stratigraphy for the whole Great Lake Basin has been determined. The sediments in the Basin include three quite distinct levels which we called, from top to bottom:

- current silt
- intermediate silt
- ancient silt

These three levels, which exist everywhere in the Basin correspond to very different sedimentation conditions connected with climate variations.

A very clear stratigraphic discontinuity separates the lower level (ancient silt) from all overlying formations. We thus could determine that the Great Lake exists such as we know it to-day only since the date of the first layer that settled on this surface of dicontinuity.

- various indications - although they did not enable us to submit

/absolutely

absolutely precise figures, suggested the comparative ancientness of the Great Lake, i.e., as we think, of the "current silt". Among other things, the discovery of a polished stone tool of the Samrong Sen period (Paleolitic) near the present banks of the Lake, shows that 2,500 years ago men had settled near the Great Lake practically in the same conditions as to-day.

- lastly, the dating through the Carbon 14 method of vegetable debris found at the bottom of the "current silt" made it possible to establish the following facts:

1) The Great Lake, such as we know it to-day, is no more than 5,000 years old. It developed in a depression that settled behind the double bar of Kompong Chhnang and of Snoc Trou.

2) The average sedimentation rate is, for the 5,000 years' life of the Lake, of the order of 0.5 mm per year at most.

3) The specific erosion to be inferred from this figure is for the whole basin of the order of 100 tons/sq.km/year, taking as a basis a sedimentation surface representing an average between the low water level and the high water level of the Great Lake.

These figures correspond to an average spread over 5,000 years; one should however not systematically conclude that the sedimentation conditions have always been constant during that time; they may have oscillated around this average and have progressed in time as everything seems to indicate.

However, these variations must have been comparatively small considering the general thinness of the sediment layers.

These results only apply to the area in which we conducted drillings. Thus, in the region of the Veal Phok, no drilling could be done in the regions that were most promising from a sedimentation viewpoint, on the one hand because topographical conditions were not favorable, and on the other hand because our equipment was solely adapted for work on lakes and open waters. The Indian Mission made numerous drillings in the region of Kompong Chhnang and will no doubt be able to provide cross-sections which may usefully contribute to the appraisal of the

/region.

region.

All in all, and everything considered, in the Great Lake area proper the sedimentation rate is low and appears in no way to assume critical proportions.

The second question we had to answer was the sedimentation budget of the Great Lake. For this task, jointly conducted with Mr. Guiscafre and the Hydrology Section of the Public Works Department, no data can be submitted for the time being. The analytical data are being processed and the final results cannot be published before a few months' interval.

We nevertheless may say that this budget will not diverge very much from the results yielded by other aspects of the study of the sedimentation of the Lake. The various data seem to piece up fairly well.

We for instance may say that the Stung of Battambang, the budget of which is easy to calculate as it does not carry sand at the level of the road which extends around the lake has a watershed whose specific erosion, for the period from October 1962 to November 1963, is 63 tons/sq.km/year. This figure is significant of the low rate of erosion despite the fact that much new land has been cleared for cultivation in the area.

We did not include the Veal Phok region in this budget as its sedimentation conditions, essentially determined by the waters of the Mekong, are very different from those of the Great Lake.

A special study of this area was undertaken during the last flood. The data have been completely processed. The daily discharges in Kompong Chhnang and Snoc Trou were not available for a quantitative interpretation of our results.

Part of the suspended load in the Mekong water, as this river flows in the direction of the Great Lake, settles between Snoc Trou and Kompong Chhnang; however, it is not yet possible to form a definite idea of the importance of this sedimentation process.

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Economic Commission for Asia and the Far East

Committee for Coordination of Investigations
of the Lower Mekong Basin
(Cambodia, Laos, Thailand and Vietnam)

UN SPECIAL FUND/MEKONG COMMITTEE/ MINERALS SURVEY/NORTH-EAST THAILAND: QUARTERLY REPORT: 1 JULY - 30 SEPTEMBER 1963

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Fig. 1 - Index map of the Loei-Chiengkarn area showing airborne magnetic anomalies and known mineral occurrences.

A. SUMMARY

1. Work done by the Thai Department of Mineral Resources/US Geological Survey Team during the report period includes:

   a) Topographic mapping, drilling, pitting, and geochemical, geophysical, and geological studies in the Loei-Chiengkarn area;

   b) Logging of all of the available drill hole cuttings from the deep water-wells of the Udon and Chayaphum salt-bearing areas;

   c) Field tours for the Executive Agent of the Mekong Committee, the Director General of the TDMR, and the newly arrived Project Manager;

   d) Laboratory work and report writing; and

   e) Technical and administrative conferences and discussions.

2. The following equipment has been received:

   a) From UN Special Fund: Two international trucks and a pole trailer;

   b) From TDMR: 20 cases of explosives, a jeep, a house trailer, a gamma ray logging instrument, and other field and office equipment;

   c) From USGS: 2 nuclear Geiger counters, one petrographic microscope, one portable light table, one slingram, and numerous small items of field equipment, including machetes and Brunton compasses.

3. A clerk-secretary was hired with UN funds to do technical typing, filing, and miscellaneous jobs such as preparation of UN travel vouchers, make appointments by telephone, etc.

4. Purchase of drilling equipment has been delayed because the cost exceeded the budget. It is hoped that the additional money needed will be granted by the Special Fund as per Dr. Schaaf's request, and that the equipment

/will be purchased

will be purchased soon. The earliest that the drill can be put into operation will probably be February 1964 taking into account the time needed for purchase and delivery, boat shipment, clearance through customs, and trans-shipment to the field. This will leave ten to eleven months for the drilling programme, out of which perhaps three will not be very productive because of the rainy season conditions. The driller's vacation towards the end of the project may call for a further cut in the time available for drilling.

5. The Thai counterpart contribution continues to equal or exceed the amount required by the plan of operations: An Office Manager has been assigned to take care of purchasing, payrolls, typing, mineograph service, map reproduction, shipment of supplies to the field, etc.; more office space and equipment has been supplied; rock thin sections have been prepared, and a large number of samples have been chemically analyzed; a jeep and other equipment has been assigned; a counterpart driller has been designated; and a house and grounds for the drill crew has been provided in Loei.

6. Valuable help has been received from the Office of the Executive Agent of the Mekong Committee and other ECAFE offices (help in preparing request for additional funds, payment of travel and allowances, typing and mimeograph service, and clearance of equipment through customs); the US Embassy (clearance of personal and USGS shipments); and US/AID (handling of shipments and providing geological information).

7. It is considered that the integrated geological-geophysical-geochemical studies phase of the project is progressing satisfactorily.

8. The physical exploration phase has consisted of drilling and surface exploration at Phu Ang. The drilling has been suspended because the

/borrowed

borrowed Failing Rotary rig was released at the end of August for return to the section of Mining Technology of TIMR (The project's organic equipment has not yet been purchased). Pitting is now underway at Phu Ang.

9. Work plans for the next quarter include:

a) Continued physical exploration, and geological, geochemical, and geophysical studies in the Loei-Chiengkarn area; and

b) Drilling for rock salt in the Udorn area using a borrowed drill rig.

B. WORK DONE

10. Work done in Thailand during the report period includes:

a) Completion or near completion of geochemical, geophysical (resistivity) and preliminary geological studies at the Phu Hin Lek Fai and Phu Thong Daeng base metal localities;

b) Initiation of topographic and geologic mapping at Phu Thong Daeng;

c) Geological and magnetometer studies at the Phu Baw Lek iron and base metal occurrence;

d) Drilling of two holes and initiation of a pitting programme at the Phu Ang iron deposit;

e) Preliminary geochemical soil sampling at Khum Thong, Phu Khok, Phu Khum Thong, and Phu [illegible];

f) Geological examination of the Phu Lek (Ban Na Muang) base metal and the Ban Tin Pha barite occurrences;

g) Installation and tuning of shortwave radios at Loei and Udorn;

h) Compilation of all available information concerning rock salt in the Udorn and Chayaphum areas;

/i) Construction

i) Construction of an explosives storage building at Loei;

j) Field conference with Dr. C. Hart Schaaf, Executive Agent of Mekong Committee, Mr. Vija Sethaput, Director General of TIMR, Mr. Kaset Pitakpaivan, Counterpart Manager, and other members of the TIMR and ECAFE;

k) Preliminary geologic reconnaissance south of the area of the airborne magnetometer survey;

l) A field trip for Mr. H. Hedstrom, newly arrived Project Manager;

m) Panning of samples from the Ban Kham Duang placer deposit in preparation for mineralogical study and assay for gold and platinum;

n) Participation in some of the sessions of United Nations (ECAFE) seminar on geochemical prospecting methods and techniques (Jacobson presented a paper on project work); and

o) A meeting with Mr. O'Keefe of the British Embassy with regard to a possible British geochemical prospecting contribution in the Loei-Chiengkarn area.

11. Geological, geophysical, and geochemical work has been done at Phu Hin Lek Fai and Phu Thong Daeng base metal localities. (Jacobson, Sangob and Thawisak, Progress Report II). The indications are favorable for the possible occurrence of base metal deposits of substantial tonnage at both localities. Additional geophysical and geological work is planned for both areas, and proposals for drilling will be based on the results of these studies.

12. The Phu Ang iron deposit is being studied. Two holes have been drilled, and a pitting programme is underway. The first drill hole encountered mainly clay (fault gouge?); the second hole, abandoned at 92 feet because of loss of circulation, penetrated iron boulders. The percentage

/of core recovery,

of core recovery, because of the difficulty of coreing boulders, was insufficient for a reliable estimate of the iron content of the deposit. The average iron content of cuttings taken at 5 foot intervals is 53.9% iron between 0-55', and 30.7% Fe between 55-88'. These figures may be used only qualitatively because the cuttings are probably diluted by drilling mud. A pitting programme designed to provide data on the amount of iron in the upper 2.5 metres of the iron boulder field is underway, and a four metre deep trench across the ridge of Phu Ang hill has been proposed. It is hoped that the trench will provide data to help guide drilling for the bedrock iron deposit.

13. A magnetometer survey at Phu Baw Lek hill (Jacobson, Sangob, and Thawisak, Progress Report II) failed to disclose a magnetic anomaly. A grab sample from a gossan boulder contains 55.65% Fe, 0.07% Cu, 0.75% Pb, and 1.16% Zn. Additional geophysical and geochemical studies are scheduled.

14. Geochemical soil sampling at the Khum Thong copper prospect is described in Progress Report II by Jacobson, Sangob, and Thawisak. Preliminary geochemical soil sampling was done by Pierson and Saner at Phu Khok, Phu Khum Thong, and Phu Sang. Weak geochemical anomalies were found at each of the four localities. Final conclusions will depend upon the results of laboratory analyses as well as upon scheduled geophysical, geochemical, and geological studies.

15. The results of a geological examination made at the Phu Lek (Ban Na Muang) base metal occurrence, is described by Jacobson, Sangob, and Thawisak, Progress Report II. The Ban Tin Pha barite occurrence was visited by Pierson and Saner (Progress Report in preparation). At Phu Lek, narrow quartz veins in siltstone are exposed by a shaft. The metal content of a weathered sample of vein material contains 0.14% Cu, 1.41% Pb, and 1.06% Zn. The mineralized zone is of very limited extent, and no further work is proposed. At the barite locality, a vein of barite is exposed;

/trenching

trenching and geological mapping is planned.

16. Topographic and geologic mapping have been started at Phu Thong Daeng by Messrs. Amorn Methikul and Nit Nitikul. The results of geochemical and geophysical studies will be plotted on this base which will also serve to help plan a drilling programme if indicated.

17. Mr. Young has installed the two project radio transceivers at Loei and Udorn respectively. The TIMR has kindly provided a standby radio operator in Bangkok from 0830 - 0845 each morning, and the radios are being used effectively, although an operator is needed for the Loei radio because the geologists go to the field before 0830.

18. All available information concerning rock salt in the Udorn and Chayaphum areas has been compiled by Jacobson (Memorandum, 25 September 1963). Eighteen drill holes were logged by examination of cuttings when available or by consultation of driller's logs when cuttings were not available. (5 of these holes were logged during the previous report period). Four cross sections and a map showing the location of the water wells were prepared. A gravity survey map from a 1962 TIMR report by Thawisak Danusawad is attached to Jacobson's memorandum. The data presented indicate that relatively thick salt beds in two areas north of Udorn might be intersected at depths greater than 680 feet. If shallower drilling is necessary for economic reasons, a hole could be drilled in the area of a gravity low south of Udorn, in the vicinity of a hole where 5 feet of salt were cored in the interval 515-525 feet (cuttings were not available for the overlying interval 505-515'). Drilling in the Chayaphum area might be done near water well H2-20, where a study of the cuttings showed rock salt in the intervals 375-390', 445-465', 470-475', and 490-530'. Another drill hole may be worthwhile near water well H2-10 if the cuttings substantiate the geologist's log which describes "Rock salt without impurities" from 290-500'. To be noted, for all of the proposed holes is the fact that data derived from cuttings may be misleading,

/and that

and that some risk is involved when drill holes are spotted on this basis.

19. An explosives house, guard house, and fence was constructed in Loei under the supervision of Mr. Thawat Japakaset. Arrangements are being made by the TIMR to provide protection of project explosives.

20. A field conference was held in the Loei-Chiengkarn area with Dr. C. Hart Schaaf, and Messrs. Vija Sethaput, Kaset Pitakpaivan, H. Sawata, and several members of TIMR. Visits were made to Phu Ang, Phu Hin Lek Fai, and to the Huai Muang Manganese Deposit. Moving pictures, taken of various aspects of the work, were shown later on Bangkok television. Mr. Manas Veeraburus conducted a field trip, which provided much information regarding the Permo-Carboniferous rock units.

21. Pierson and Saner (Progress Report in preparation) made spot checks of geologic conditions south of the limits of the airborne magnetometer flight area. Discussions were also held with Mr. Manas Veeraburus of TIMR, who is doing geologic work in this area. The work and discussions indicate that geologic conditions in the area checked are similar to those in the area to the north which contains the Phu Ang, Phu Hin Lek Fai, and Phu Thong Daeng mineral occurrences; it would probably be worthwhile to prospect the southern area for possible iron and base metal deposits.

22. A short field trip was conducted by Young and Pierson to show the project area to the recently arrived (August 27) Project Manager, Mr. Helrer Hedstrom. The trip included a visit to the Project's workshop and storage area at Udorn, to the field office and the mobile equipment storage in Loei, and to the Phu Ang and Phu Thong Daeng mineral occurrences near Loei.

/23. The drill samples

23. The drill samples from the Ban Kham Duang platinum-gold placer locality were panned by a TDMR technician under the supervision of Mr. Boonmai Intuputi. The technician is a woman said to have had forty years experience in this work. The concentrates will be studied mineralogically and then sent for platinum and gold assay.

24. Jacobson and Pierson attended some of the sessions of the UN/ECAFE Seminar on geochemical prospecting. Jacobson presented a paper concerning project work at Phu Hin Lek Fai.

25. Messrs. Hedstrom and Pierson had a meeting with Mr. O'Keefe of the British Embassy as a follow-up of a request by Dr. Schaaf upon information obtained at the geochemical conference that the British Overseas Geological Survey might be able in the near future to provide a geochemical reconnaissance survey in the Loei-Chiengkarn area as a contribution to the Mekong Project. A detailed proposal will be submitted if Mr. O'Keefe notifies Dr. Schaaf that such a grant by the United Kingdom is to be given.

C. MAJOR PROBLEMS

26. A major problem at present is the lack of drilling equipment. As stated above in paragraph 4, it is hoped that the drilling equipment will arrive February 1964, so that the time available for the drilling programme may possibly be a little more than one third of the time foreseen in the Plan of Operations.

27. Upon arrival of the two drilling rigs, an experienced hard rock driller will be needed in addition to the present drilling supervisor. This will make it possible to drill two shifts per day simultaneously at two different localities. The additional driller will also be needed to help train the four drill crews.

/28. A smaller

28. A smaller but nevertheless important requirement that should be met at the time of arrival of the drilling equipment will be the addition of a warehouseman to the Thai project staff.

29. Another problem is the current lack of certain geophysical equipment (magnetometers) which is necessary for present and future work. This work includes the locating on the ground of the cause of anomalies detected by previous airborne magnetic work; the prospecting for magnetic orebodies not indicated by the very wide-meshed airborne work; and the detailed mapping of known prospects in order to locate drill holes, trenches, and adits. A letter was sent on 6 September to the United States Geological Survey requesting loan of two dip needles, and it is hoped that they will arrive in the near future.

D. GOVERNMENT PARTICIPATION

30. Government participation continues to be provided in amounts equal to or in excess of that required by the Plan of Operations:

a) The professional personnel have been fully supplied;

b) The sub-professional personnel have been assigned as needed;

c) Equipment, supplies, and miscellaneous items have been supplied as required and

d) Loan of previously reported transportation and surveying equipment as well as logistical, technical, and administrative help continues.

31. Extra personnel assigned or to be assigned include: An Office Manager, a field office manager, and a counterpart driller.

32. Additional equipment provided by TIMR this quarter includes: A gamma ray logging instrument, an intercom system, a jeep for reconnaissance work, a 1 KW generator, two filing cabinets, two typewriters, a large

/amount

amount of Landrover parts, a house trailer, a dictating machine, a coffin hoist, and 12 beds with mattresses for field headquarters.

33. Services and additional facilities provided this quarter include: panning of Ban Kham Duang samples; 191 laboratory analyses for copper, lead, zinc, and iron; courier service to field headquarters for urgent matters; purchasing and shipping services; preparation of 7 rock thin sections; two additional rooms of Bangkok office space (one of which is air-conditioned) totalling over 85 square meters; and a building and yard for drillers and mechanics at Loei.

E. POSITION OF PROJECT

34. Paragraph 35 of the Plan of Operations (translated into terms of the 1/63 instead of the 10/61 starting date) gives the following schedule:

"d) Loei-Chiengkarn area: geological and geophysical investigations
" for manganese iron ore and baryte: January 1963 - December 1964.
" Drilling: January 1964 - December 1964.

"e) Udorn-Chayaphum area: Drilling for rock-salt (about five holes
" with aggregate depth of 2,000 metres): January 1963 - December 1963."

35. Work in the Loei-Chiengkarn area is progressing satisfactorily. Most of the known mineral deposits located within the area of the previous air-borne magnetic survey have already received preliminary examination, and six new prospects have so far been located within the area. Detailed geochemical and geophysical studies have been made at two base metal occurrences, and two holes have been drilled at the Phu Ang iron deposit. Pitting is in progress at Phu Ang. Remaining to be examined are 14 previously known mineral occurences.

36. Drilling for rock salt has not been started because the heavy drill has not arrived. An extension of the time for this drilling programme

/may be

may be needed in order to complete the required 2,000 metres of drilling.

F. PLANS FOR FUTURE WORK

37. Work planned for the remainder of calendar year 1963 in the Loei-Chiengkarn area includes:

a) Geological mapping of about 500 square km in the Ban Pa Pao quadrangle southeast of Loei to provide data important to the understanding of Phu Thong Daeng, Phu Ang, and Phu Hin Lek Fai mineral occurrences; (the resulting map will probably be published by TDMR as the first in a series of mineral investigation maps);

b) Topographic and geologic mapping at Phu Thong Daeng (in progress), Phu Hin Lek Fai, Phu Lek (Chiengkarn), Phu Khok-Phu Khum Thong, Ban Tin Pha, Phu Lek (Ban That), and at some of the manganese occurrences northeast of Chiengkarn.

c) Electromagnetic surveys at Phu Thong Daeng, Phu Hin Lek Fai, Phu Khok-Phu Khum Thong, Phu Baw Lek, Phu Han, Phu Sang, and at the site of the aeromagnetic anomaly northeast of Phu Ang.

d) Geochemical and geological studies of Phu Khok-Phu Khum Thong, Phu Baw Lek, Phu Han, Phu Sang, Phu Hin Lek Fai (completion of a study started this quarter), and of the area including the aero-magnetic anomaly northeast of Phu Ang.

e) Completion of the resistivity survey at Phu Hin Lek Fai.

f) Physical exploration including detailed geological mapping and sampling of pits and trenches at Phu Ang (in progress), Phu Hin Lek Fai, Phu Thong Daeng, Phu Lek (Ban That), the Ban Tin Pha barite occurrence, the Rong Rae (Phu Khok-Yai) lead-zinc prospect (low priority); and

/the manganese

and the manganese occurrences (Huai Suai, Huai Suak, and Huai Muang).

g) Preliminary geologic examination of as many as possible of the 14 mineral occurrences shown in the Ban Pak Chom-Ban Kaeng Kai area by the August 1962 TIMR map.

Basic material and this first draft prepared by the undersigned in consultation with the Executive Agent of the Mekong Committee,

Bangkok, 11 October 1963,

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